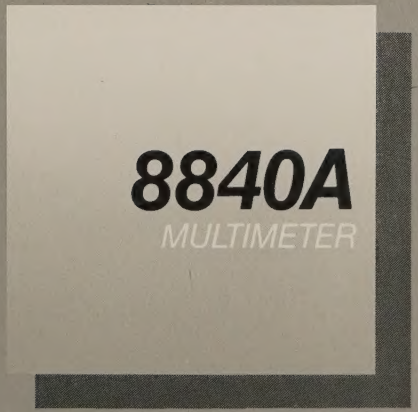
GETTING STARTED

A New User's Guide



FLUKE

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GETTING STARTED

A New User's Guide

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8840A

MULTIMETER

FLUKE

CONTENTS

THIS MANUAL introduces you to the Fluke 8840A Digital Multimeter and gives a brief introduction to remote programming using the IEEE-488 Interface option.

For more complete operating and programming instructions, please refer to the 8840A Instruction Manual.

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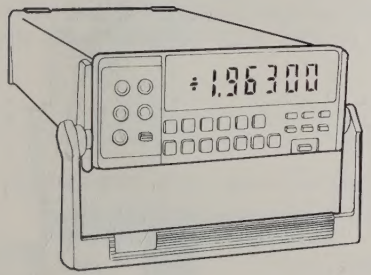
THE 8840A DIGITAL MULTIMETER



The Fluke Model 8840A sets new standards for low-cost 5-1/2 digit multimeters in accuracy, speed, and ease of use. With its IEEE-488 Interface option, the 8840A is the most capable system instrument in its class.

Features of the 8840A include:

- Highly legible vacuum fluorescent display
- Intuitively easy front panel operation
- Basic dc accuracy of 0.005% for 1 year
- 2-wire and 4-wire resistance measurement
- DC current measurement
- Up to 100 readings per second
- Closed-case calibration (No internal adjustments)
- Built-in self-tests

Options, which can be installed at any time, include the IEEE-488 Interface (Option -05) and True RMS AC (Option -09), which lets you measure ac voltage and current.

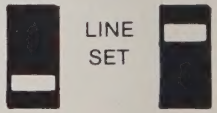
SETTING UP THE 8840A

Connecting to Line Power

WARNING

TO AVOID SHOCK HAZARD, CONNECT THE INSTRUMENT POWER CORD TO A POWER RECEPTACLE WITH EARTH GROUND.

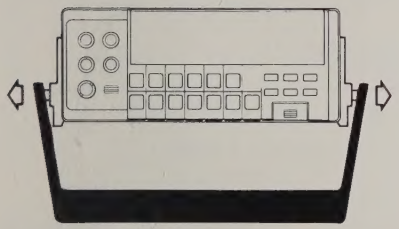
To avoid instrument damage, check that the rear-panel line voltage selection switches are set to the power-line voltage in your area. (See below.) For fire protection with power-line voltages from 198V to 250V, replace the rear panel 1/4A, 250V fast fuse with the 1/8A, 250V slo-blo fuse supplied with the instrument.

FOR THIS LINE VOLTAGE:	USE THIS SWITCH SETTING:	FOR THIS LINE VOLTAGE:	USE THIS SWITCH SETTING:
90V to 109V		198V to 229V	
109V to 132V		229V to 250V	

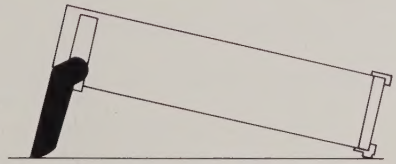
Adjusting the Handle

The handle provides two viewing angles for bench-top use. To adjust its position, pull the ends out to a hard stop (about 1/4 inch on each side) and rotate it to one of the four stop positions shown below. To remove the handle, adjust it to the vertical stop position and pull the ends all the way out.

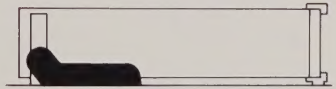
PULL ENDS OUTWARD
TO ROTATE



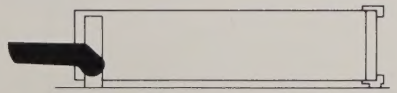
1. Viewing position



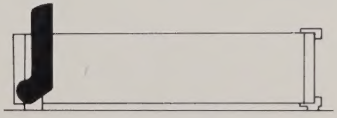
2. Alternate viewing position



3. Carrying position



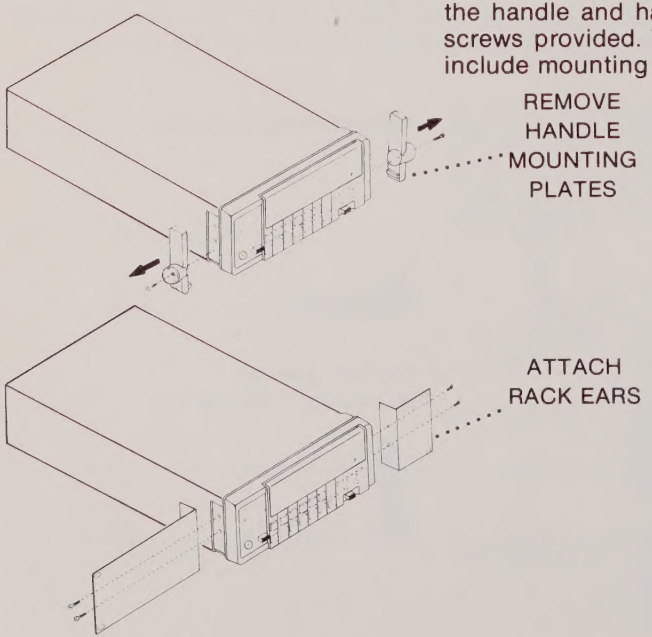
4. Removal position
(to remove, pull ends out)

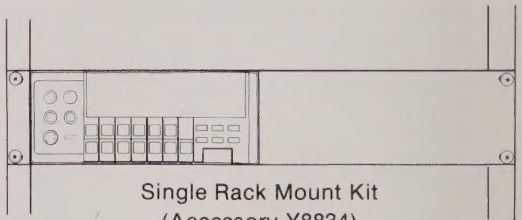


SETTING UP THE 8840A

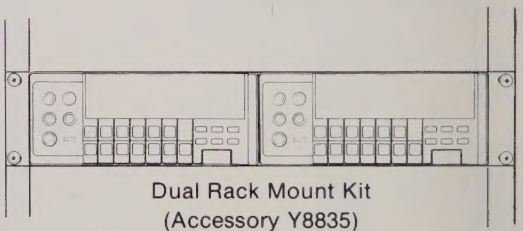
Rack Mounting Kits

You can mount the 8840A in a standard 19-inch rack panel using the accessory rack mounting kits shown below. To install the Single Rack Mount Kit, remove the handle and handle mounting plates, and attach the rack ears with the screws provided. The Dual Rack Mount Kit is installed similarly. (Both kits include mounting instructions.)





Single Rack Mount Kit
(Accessory Y8834)



Dual Rack Mount Kit
(Accessory Y8835)

Power-Up Self-Test

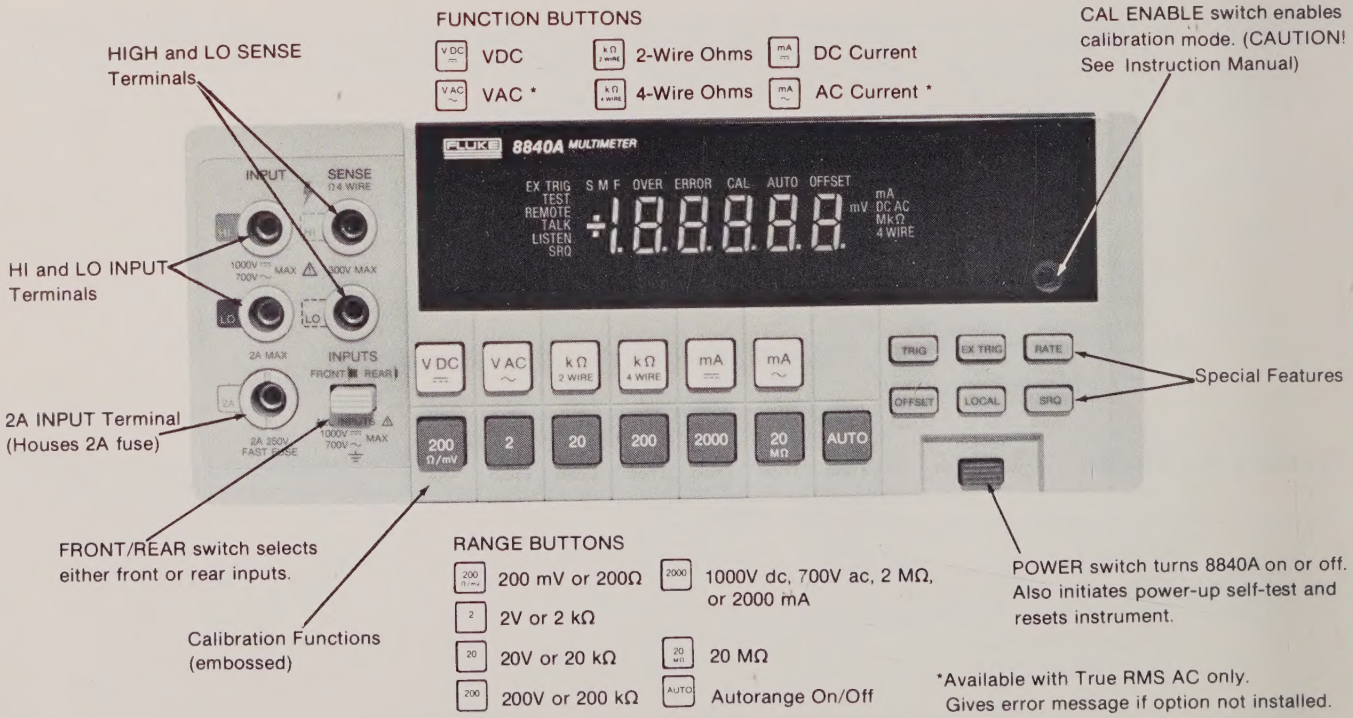
When the 8840A is turned on, all display segments light up for about 2 seconds while the instrument performs an internal self-test. The 8840A then assumes the following configuration:

- VDC function
- Autorange, starting in the 1000V range
- Slow reading rate
- Continuous, internal trigger
- OFFSET off
- Local (front panel) control

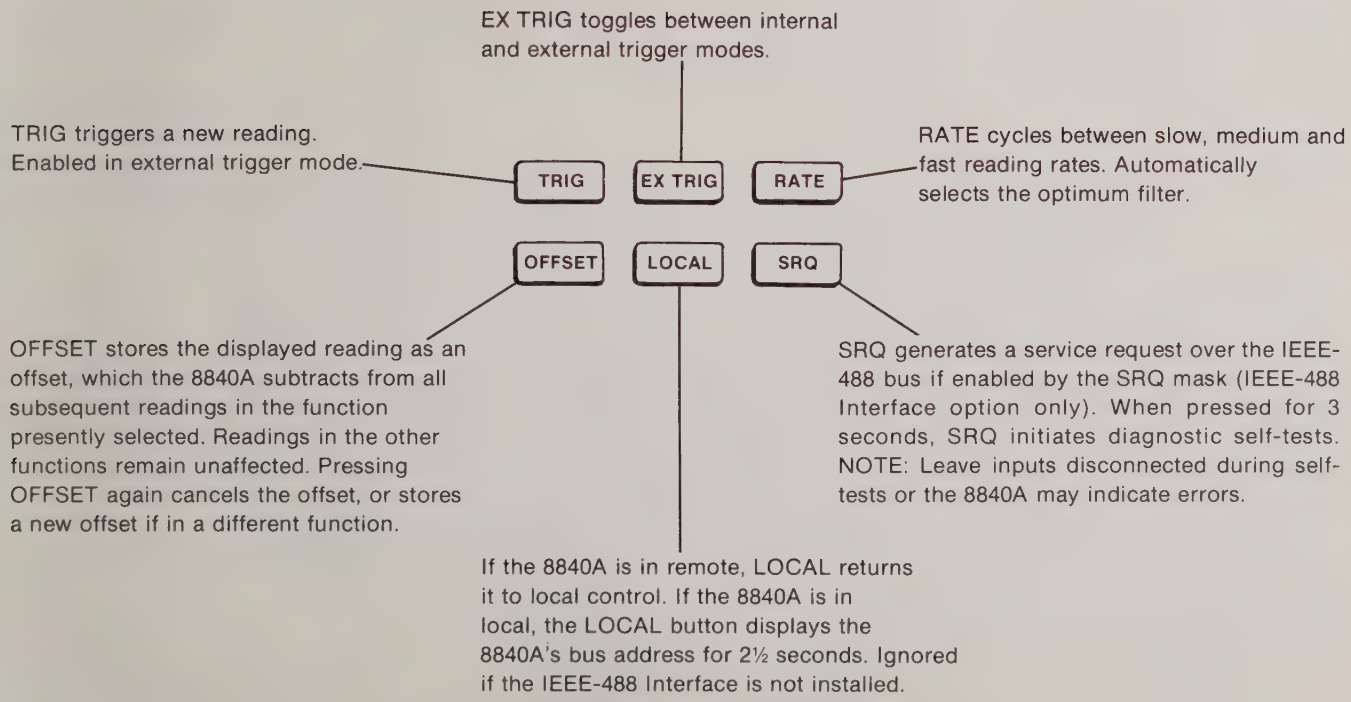
Freezing the Display

During the power-up self-test, you can freeze the display by pressing the SRQ button while the display is lit. All display segments will then remain lit until you press any button.

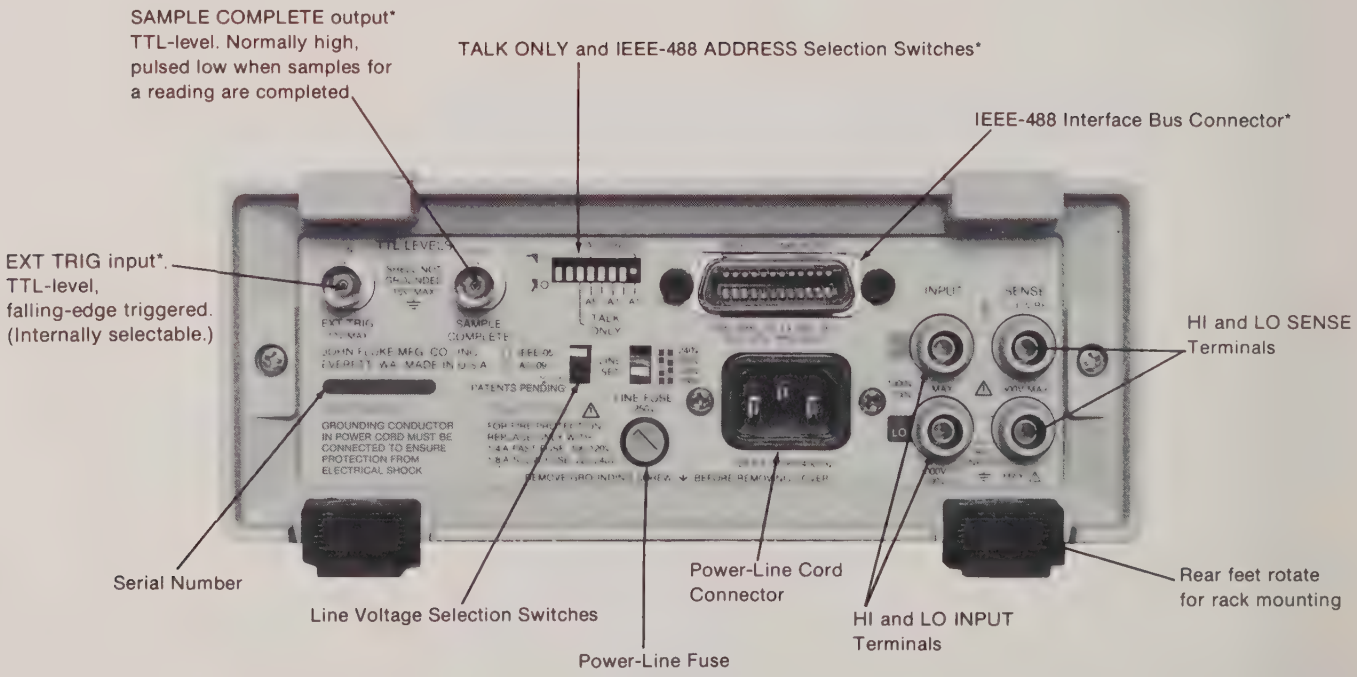
THE FRONT PANEL



SPECIAL FEATURES


EX TRIG toggles between internal and external trigger modes.
TRIG triggers a new reading. Enabled in external trigger mode.
RATE cycles between slow, medium and fast reading rates. Automatically selects the optimum filter.
TRIG
EX TRIG
RATE
OFFSET
LOCAL
SRQ
OFFSET stores the displayed reading as an offset, which the 8840A subtracts from all subsequent readings in the function presently selected. Readings in the other functions remain unaffected. Pressing OFFSET again cancels the offset, or stores a new offset if in a different function.
SRQ generates a service request over the IEEE-488 bus if enabled by the SRQ mask (IEEE-488 Interface option only). When pressed for 3 seconds, SRQ initiates diagnostic self-tests. NOTE: Leave inputs disconnected during self-tests or the 8840A may indicate errors.
If the 8840A is in remote, LOCAL returns it to local control. If the 8840A is in local, the LOCAL button displays the 8840A's bus address for 2½ seconds. Ignored if the IEEE-488 Interface is not installed.

THE REAR PANEL

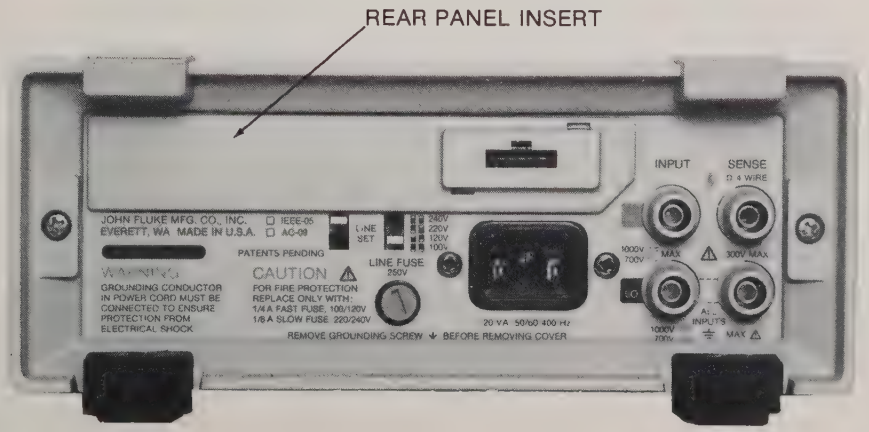

SAMPLE COMPLETE output* TTL-level. Normally high, pulsed low when samples for a reading are completed.
TALK ONLY and IEEE-488 ADDRESS Selection Switches*
IEEE-488 Interface Bus Connector*
EXT TRIG input*. TTL-level, falling-edge triggered. (Internally selectable.)
HI and LO SENSE Terminals
Serial Number
Line Voltage Selection Switches
Power-Line Fuse
Power-Line Cord Connector
HI and LO INPUT Terminals
Rear feet rotate for rack mounting
*Available only with IEEE-488 Interface

Rear Panel Insert

If your 8840A does not have the IEEE-488 Interface, the upper portion of the rear panel is covered by an insert as shown below. Do not remove the insert unless you are adding the IEEE-488 Interface.

CAUTION

The rear panel insert is attached from inside the case. Refer to the 8840A Instruction Manual for instructions on removing it.

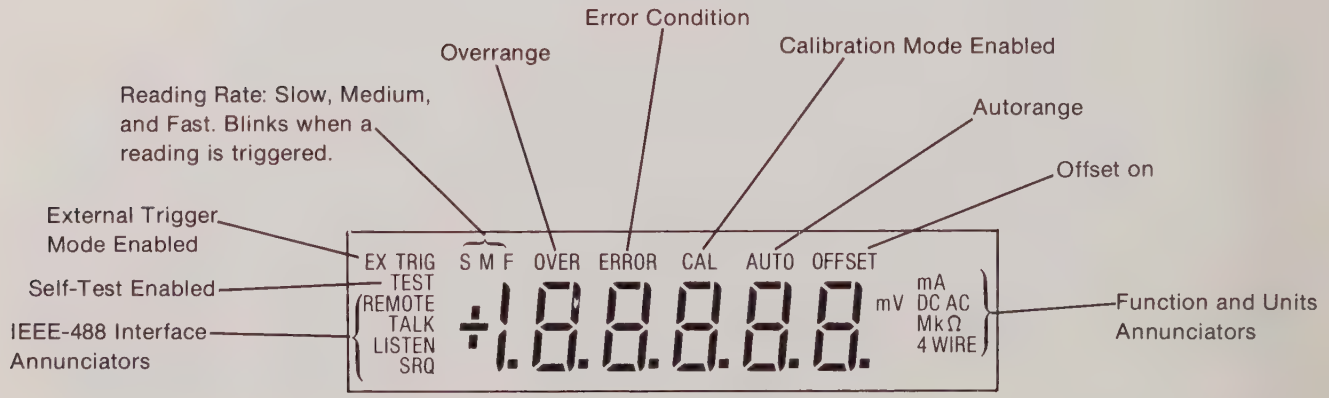


THE DISPLAY

The Display

The vacuum fluorescent display indicates explicit units for all functions and ranges, so you never have to interpret readings.

When the 8840A is in the external trigger (EX TRIG) mode, pressing any front panel button blanks the numeric field in the display until a new measurement is triggered. This ensures that all readings correspond to the instrument configuration indicated by the display annunciators.



Overrange Indication

In most ranges the 8840A indicates the input is overrange as shown below. The sign and the position of the decimal point depend on the function and range.

As a safety feature, the 8840A treats the 1000V dc and 700V ac ranges differently. In these ranges, the 8840A indicates when the input exceeds the input overload limit of 1000V dc or 700V ac, respectively, by lighting the OVER annunciator and flashing the display. Readings are still displayed.

THE DISPLAY

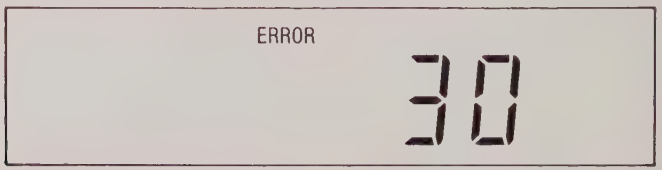
Error Messages

If the 8840A detects an error, it displays an error message for about 2-1/2 seconds and then resumes normal operation. During this time, the front panel buttons are ignored. The error message consists of the ERROR annunciator and a two-digit error code. Error codes are explained on the next page.

If the FRONT/REAR switch is set to the REAR position while the mA DC or mA AC function is selected, error 31 is displayed. In this case the error message is displayed until you return the switch to the FRONT position or select another function.

When you run the diagnostic self-tests (which are initiated by pressing the SRQ button for 3 seconds), be sure the input terminals are disconnected. Otherwise, the 8840A may display some of the self-test errors (errors 01 to 29).

If the 8840A displays self-test errors even when the input terminals are disconnected, there may be a hardware problem in your 8840A. In that event, refer to the 8840A Instruction Manual or contact your local Fluke representative.



Error 30: AC function selected without True RMS AC Converter option.

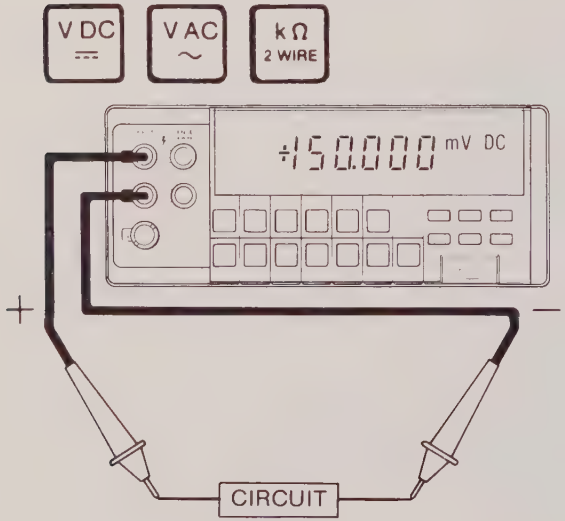
Error Codes

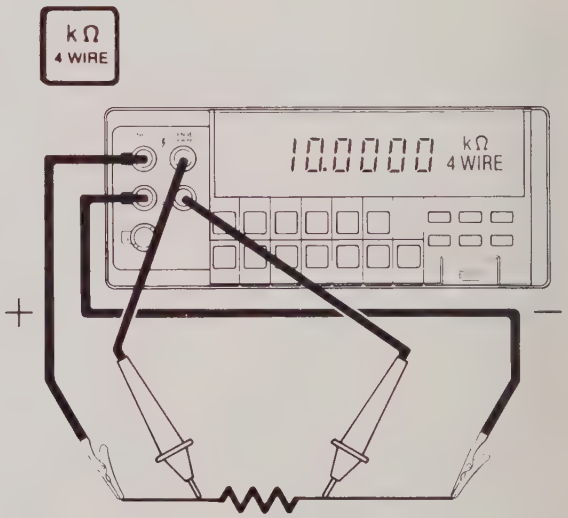
ERROR CODE	MEANING
	SELF-TEST ERRORS
01-29	See 8840A Instruction Manual.
	OPERATION ERRORS
30	AC functions available only with True RMS AC option.
31	mA AC or mA DC function selected while REAR inputs selected.
32	OFFSET selected with reading unavailable or overrange.
40	Computed calibration constant out of range.
41	Calibration input out of acceptable range.
42	Calibration Memory write error.
50	Guard crossing error detected by In-Guard μC.
51	Calibration command not valid unless calibration mode is enabled.
52	Command not valid at this time. Check whether 8840A is in cal mode and if so which part of the cal procedure it is in.
53	Invalid calibration value in Put command. (Example: Sending a negative value during ac calibration.)
54	Command not valid in calibration verification.
56	Variable inputs not allowed during A/D calibration. Use prompted value.
60	Device-dependent commands not valid during self-test.
71	Syntax error in device-dependent command string.
72	Guard crossing error detected by Out-Guard μC.
77	IEEE-488 Interface self-test error.

MAKING MEASUREMENTS

Voltage and Resistance

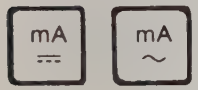
To measure voltage or resistance, select the desired function and connect the test leads as shown. Resistance can be measured in either the 2-wire or 4-wire configuration.





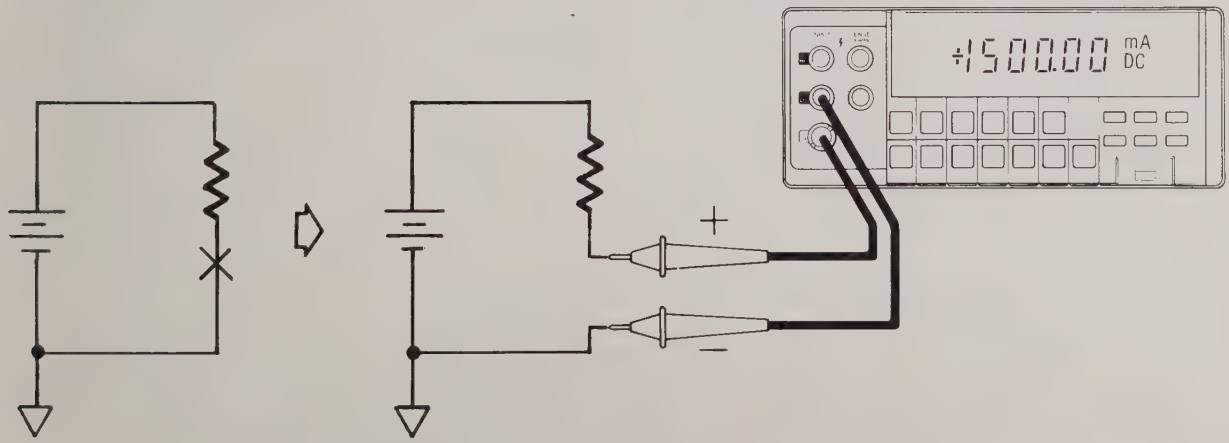
MAKING MEASUREMENTS

Current



To measure current, select the desired function and connect the test leads as follows:

1. Turn off power in the circuit to be measured.
2. Break the circuit (preferably on the ground side to minimize the common mode voltage), and place the 8840A in series at that point.
3. Turn on power in the circuit, and read the display.
4. Turn off power in the circuit, and disconnect the 8840A.



MAKING MEASUREMENTS

Offset Measurements

WARNING

WHEN THE OFFSET FEATURE IS IN USE, DISPLAYED READINGS ARE RELATIVE AND MAY NOT INDICATE THE PRESENCE OF DANGEROUS POTENTIALS AT THE INPUT CONNECTORS OR TEST LEADS. USE CAUTION TO AVOID ELECTRIC SHOCK OR INSTRUMENT DAMAGE.

The OFFSET button stores a reading so that you can make relative measurements. When an offset is in use, the display always has a + or - sign (even in the resistance and ac functions) since the reading represents a numeric difference.

Overload Protection Limits

WARNING

TO AVOID SHOCK HAZARD AND/OR INSTRUMENT DAMAGE, DO NOT APPLY INPUT POTENTIALS THAT EXCEED THE OVERLOAD PROTECTION LIMITS SHOWN BELOW.

INPUT OVERLOAD PROTECTION LIMITS

FUNCTION	CONNECTORS	MAXIMUM INPUT
VDC	INPUT HI and LO:	1000V dc
mA DC	2A INPUT and INPUT LO:	2000 mA
2 WIRE/4 WIRE kΩ	INPUT HI and LO: SENSE HI and LO:	300V rms 300V rms
VAC	INPUT HI and LO:	700V rms, 1000V peak or 2 x 10^7 V-Hz (whichever is less)
mA AC	2A INPUT and INPUT LO:	2000 mA rms
All Functions	Any terminal to earth:	1000V dc or peak ac

REMOTE OPERATION

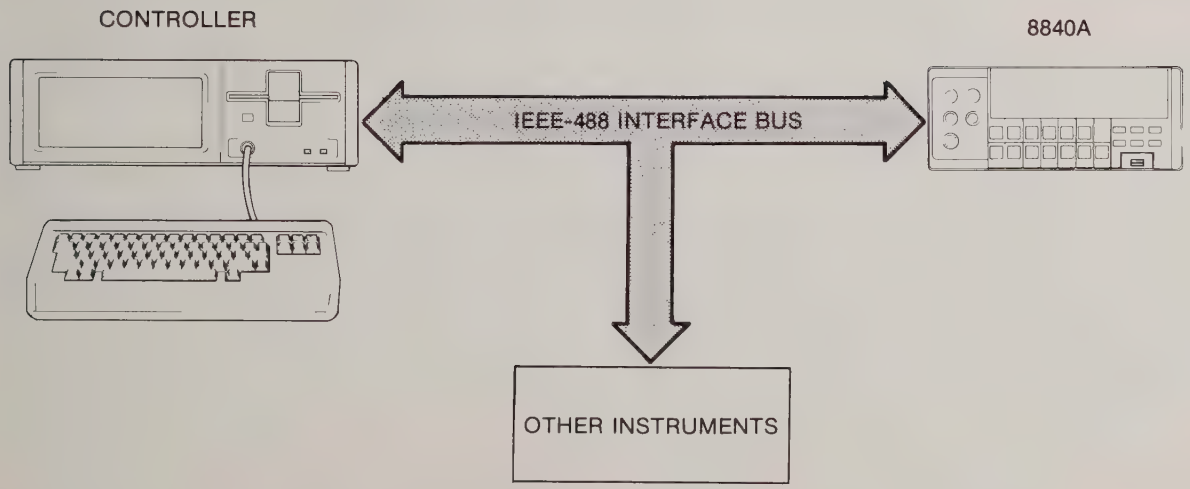
The IEEE-488 Interface

The IEEE-488 Interface option turns the 8840A into a fully programmable systems instrument for remote operation over the IEEE Standard 488-1978 interface bus.

The 8840A can be under complete, interactive control from a remote bus controller. Or when set to the talk-only mode, the 8840A can be connected to a printer or data logger and dedicated to a single task.

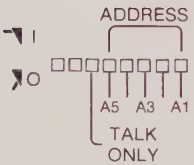
For an introduction to the IEEE-488 interface bus, request Fluke Application Bulletin AB-36, "IEEE Standard 488-1978 Digital Interface for Programmable Instrumentation."

REMOTE OPERATION



REMOTE OPERATION

Connecting to the IEEE-488 Interface



To set up the 8840A on the IEEE-488 bus,

1. Set the 8840A IEEE-488 address using the rear panel IEEE-488 ADDRESS switches (see below).

2. Plug an IEEE-488 cable into the 8840A rear panel IEEE-488 connector, secure it, and connect the cable to one of the other instruments in your system.

3. Switch on the 8840A.

Whenever the 8840A is under local control, its IEEE-488 address can be displayed on the front panel by pressing the LOCAL button. The address is displayed with a minus sign if the 8840A is set to the talk-only mode.

REAR PANEL ADDRESS SETTINGS

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
00	0	0	0	0	0	0
01	0	0	0	0	0	1
02	0	0	0	0	1	0
03	0	0	0	0	1	1
04	0	0	0	1	0	0
05	0	0	0	1	0	1
06	0	0	0	1	1	0
07	0	0	0	1	1	1
08	0	0	1	0	0	0
09	0	0	1	0	0	1
10	0	0	1	0	1	0

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
11	0	0	1	0	1	1
12	0	0	1	1	0	0
13	0	0	1	1	0	1
14	0	0	1	1	1	0
15	0	0	1	1	1	1
16	0	1	0	0	0	0
17	0	1	0	0	0	1
18	0	1	0	0	1	0
19	0	1	0	0	1	1
20	0	1	0	1	0	0
21	0	1	0	1	0	1

ADDRESS	TALK ONLY	A5	A4	A3	A2	A1
22	0	1	0	1	1	0
23	0	1	0	1	1	1
24	0	1	1	0	0	0
25	0	1	1	0	0	1
26	0	1	1	0	1	0
27	0	1	1	0	1	1
28	0	1	1	1	0	0
29	0	1	1	1	0	1
30	0	1	1	1	1	0
31	Not allowed					
TALK ONLY	1	X	X	X	X	X
X = setting does not matter						

REMOTE OPERATION

Talk-Only Mode

The talk-only mode lets you take advantage of the remote capability of the 8840A without having to use an instrument controller. To put the 8840A in the talk-only mode:

1. Turn the 8840A POWER switch OFF.
2. Set the rear panel TALK ONLY bit switch to 1 (the up position).
3. Connect the 8840A via the IEEE-488 bus to your printer, data logger, or other device.
4. Configure the other device as a listener only.
5. Turn the 8840A POWER switch ON.

Remote Programming

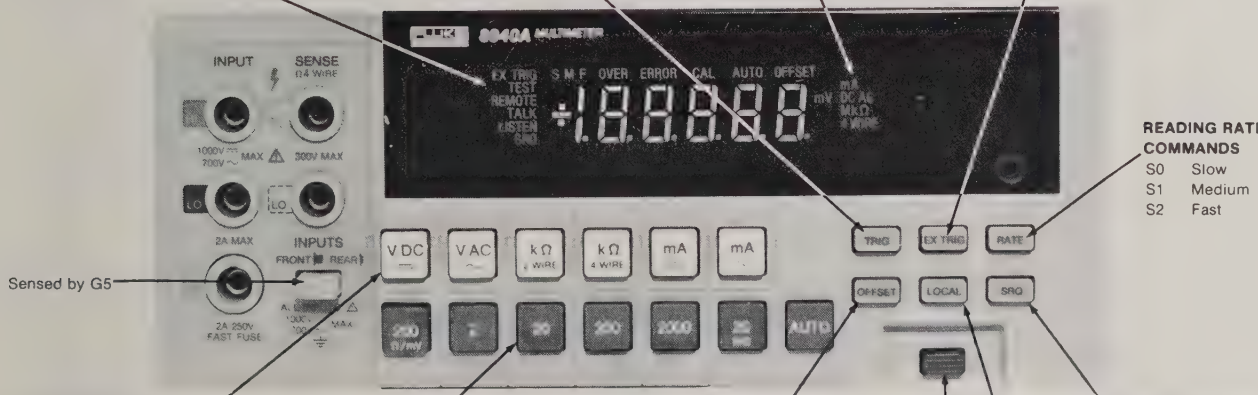
The 8840A device-dependent command set makes remote operation much like front panel operation. The following page shows the device-dependent commands that correspond directly to the front panel. For complete programming instructions, including a complete list of device-dependent commands, refer to the 8840A Instruction Manual.

DISPLAY COMMANDS
D0 Normal Display
D1 Blank Display

TRIGGER COMMANDS
? Trigger Measurement
GET Trigger and Execute

SUFFIX COMMANDS
Y0 Disable Suffix
Y1 Enable Suffix

TRIGGER MODE COMMANDS
T0 Continuous Trigger
T1-T4 External Trigger



READING RATE COMMANDS
S0 Slow
S1 Medium
S2 Fast

Sensed by G5

FUNCTION COMMANDS
F1 VDC
F2 VAC
F3 2 WIRE kΩ
F4 4 WIRE kΩ
F5 mA DC
F6 mA AC

RANGE COMMANDS
R0 Autorange On
R1 200 mV, 200Ω
R2 2V, 2 kΩ
R3 20V, 20 kΩ
R4 200V, 200 kΩ
R5 1000V dc, 700V ac, 2 MΩ, 2000 mA
R6 20 MΩ
R7 Autorange Off

OFFSET COMMANDS
B0 Offset Off
B1 Offset On

SELF-TEST COMMAND
Z0 Begin Self-Tests

GTL Go To Local

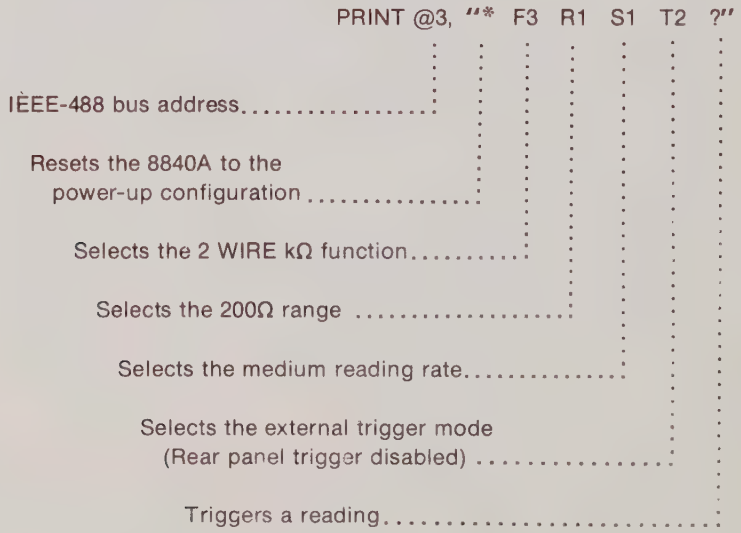
DEVICE-CLEAR COMMAND
* Reset 8840A to power-up state

See the 8840A Instruction Manual for a complete list of commands.

REMOTE OPERATION

Typical Command String

Here is a typical command string as it might be sent from a Fluke 1722A Instrument Controller. The string configures the 8840A and triggers a reading. The PRINT command automatically sends terminators (CR, LF, and/or EOI) to the 8840A at the end of the command string.



Programming Example

The following program was written in Fluke BASIC for the Fluke 1722A Instrument Controller. The program assumes the 8840A ADDRESS switches are set to address 3.

```
1!  THIS EXAMPLE SELECTS VDC (F1), AUTORANGE (R0), SLOW READING RATE (S0),
2!  AND EXTERNAL TRIGGER WITH REAR PANEL TRIG DISABLED AND DELAY ENABLED (T2).
3!  THE CONTROLLER IS A FLUKE 1722A. THE 8840A IS SET TO IEEE-488 ADDRESS 3.
4!  THE PROGRAM TAKES ONE READING AND THEN STOPS.
10  INIT PORT 0                    !CLEAR INTERFACE (SENDS IFC)
20  CLEAR PORT 0                   !CLEAR 8840A TO POWER-UP STATE (SENDS DCL)
30  PRINT @3, "F1 R0 S0 T2 ?"      !CONFICURE AND TRIGGER 8840A
40  INPUT @3, R                    !GET DATA FROM 8840A
50  PRINT R                        !PRINT DATA ON 1722A SCREEN
60  END
```

Other Controllers

Every controller handles IEEE-488 commands somewhat differently. If you are using a controller other than the 1722A, refer to your controller's programming manual for details. Examples using several popular controllers are given in the 8840A Instruction Manual.